

# T2160 "REMOTE CONTROL LINK" USER'S MANUAL

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## GENERAL INFORMATION

### WARRANTY STATEMENT

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**WARRANTY**

*Our Products are warranted for a period of 24 months from date of purchase against faulty materials and workmanship. Should any fault occur the unit should be returned to the Vendor, freight pre-paid. Please include a brief description of the fault to assist with prompt return. any unauthorized alterations or repairs will invalidate the warranty.*

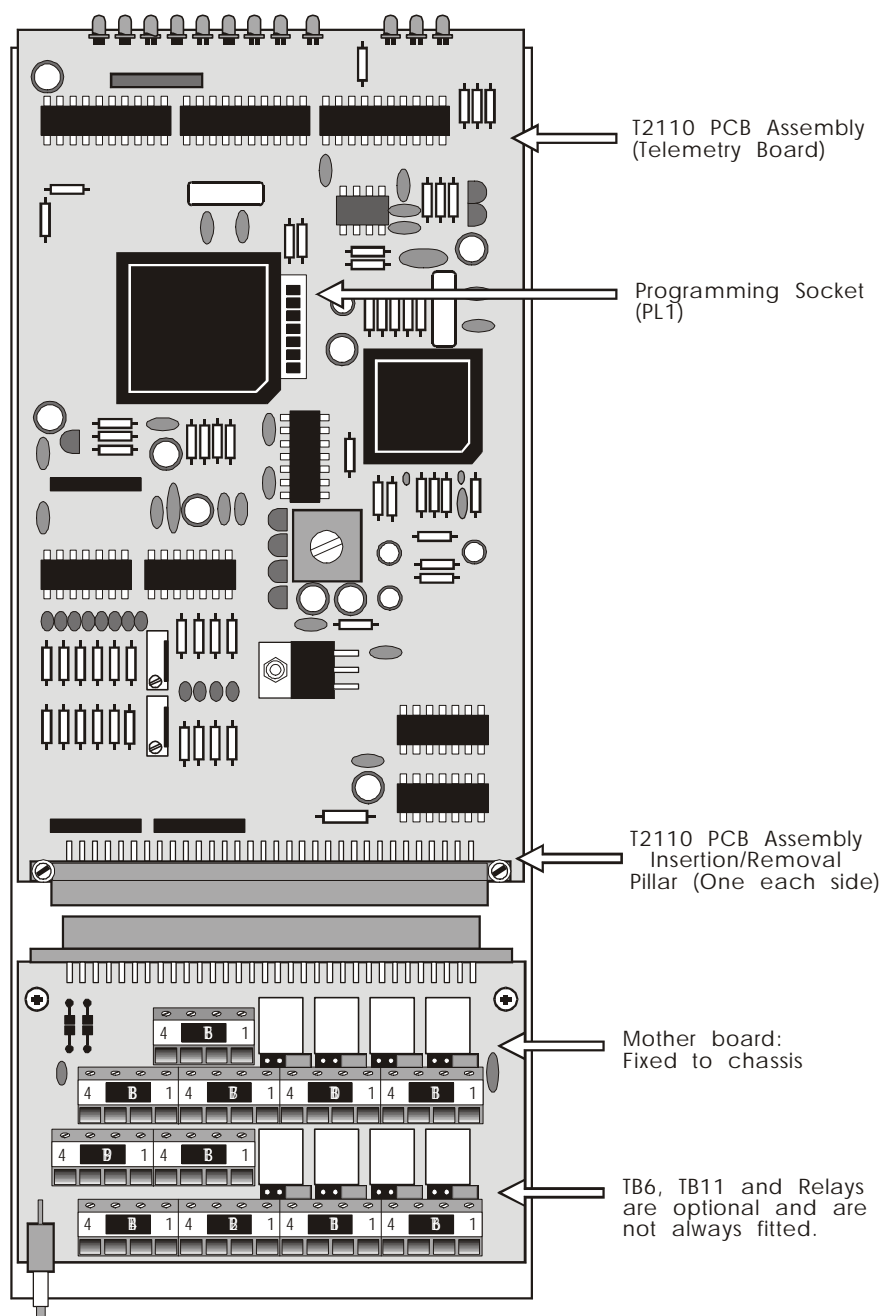
**DISCLAIMER**

*All information provided in this document is carefully prepared and offered in good faith as a guide in the installation, use and servicing of our products. Installers must ensure that the final installation operates satisfactorily within the relevant regulatory requirements. We accept no responsibility for incorrect installation. We reserve the right to change products, specifications, and installation data at any time, without notice.*

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**1.0 INTRODUCTION:** "REMOTE CONTROL LINK" is a new generation telecontrol range produced specifically with the small to medium user in mind. The module incorporates the very latest in random tone signalling technology which allows the unit to be used on a wide range of communication networks with the absolute minimum of installation and setup procedures. The versatility and rugged nature of the signalling formats used will ensure that reliable operation will be experienced over long periods of operation.

The basis for this product is the single chip random tone technology provided by the propriety SIGTEC MD09 microprocessor which is placed under the control of a CPU (Central Processor Unit 87C552).



The "REMOTE CONTROL LINK" signalling module can be utilized to continually monitor 2 analog and 8 digital signals and relay the status or condition of these inputs back to a base station either over line or radio circuits. "REMOTE CONTROL LINK" also has the ability to perform remotely a number of control functions (2 analog and 8 digital) when instructed by companion controlling unit.

The basic configuration for "REMOTE CONTROL LINK" is commonly referred to, as the MASTER/SLAVE format. This is where the "MASTER" controls and reads back from the "SLAVE" it's current input and output conditions.

A wide range of other configurations for "REMOTE CONTROL LINK" are also possible including control of a number of "SLAVES" using a universal or purpose built Personal Computer base controller.

If further information is required on any aspect of the "REMOTE CONTROL LINK" range please contact your nearest SIGTEC/SIGTONE Office.

**2.0 PROGRAMMING INSTRUCTIONS:** All programming is carried out by the IBM PC programming kit which is provided as an accessory item. This kit consists of the following items:

- (1) Sigtec P9932 universal hardware programming kit.
- (2) Sigtec T2160/WE01 IBM™ compatible Product Support diskette. This is available in either 5.25 or 3.5 inch formats.

The programming facility of "REMOTE CONTROL LINK" allows the unit to be tailored to a number of options. All programmed parameters reside in non-volatile memory (EEPROM) i.e. the programmed information will not be lost in the case of power failure.

**2.2 Programming Procedure:** Programming "REMOTE CONTROL LINK" to your specific requirements is achieved by removing the top cover from the T2160 and inserting the P9932 programming wand (S1515/01 option) into PL1 socket (see figure 1).

**2.3 Hardware:** Connect the P9932 to the printer port of the IBM PC to be used as the programming computer as per the instructions provided with the programming kit.

Select the S1515 programming probe as outlined in Section 4 of the P9932 operating instructions.

This is plugged into the PCB header socket (PL1) provided on the T2110/01 PCB assembly (refer to figure 1).

**NOTE:** *The Header socket has a polarizing pin. It is important that the programming probe is inserted into the socket in the correct way taking into account the polarizing pin which is matched directly to the missing probe pin.*

It is now possible to apply the power to "REMOTE CONTROL LINK" and you are now ready for programming.

- 2.3 Software:** Using the software provided (T2160/WE01), boot the program in the normal way using the batch file provided. If your computer is fitted with a hard disk it suggested that the programming software be installed onto this for ease of use.

The software provides all the information necessary to effect speedy and efficient programming. Also included within the programming software is a full Handbook and other general information.

### 3.0 INPUT SPECIFICATIONS:

- 3.1 Analog Inputs:** "REMOTE CONTROL LINK" as supplied in its standard format, has two analog inputs. Each of these inputs are configurable to 1.5 to 30 volts, or 0 to 20mA.

- ### 3.2 Re-Calibration of Analog Inputs:
- An example of voltage calibration of analog 1, and current calibration of analog 2 is described below and illustrated in figure 2.

- 3.3.1 Analog 1 - 0 to 5 Volt Calibration:** Apply the maximum required source voltage to terminal block ANALOG 1 IN (TB3-3). Connect a voltmeter to ANALOG 1 OUT (TB8-3). Apply an earth to EXTERNAL INPUT 1 (TB5-4) which forces ANALOG 1 OUT to read ANALOG 1 IN and adjust VR1 for an output of 5 volts.

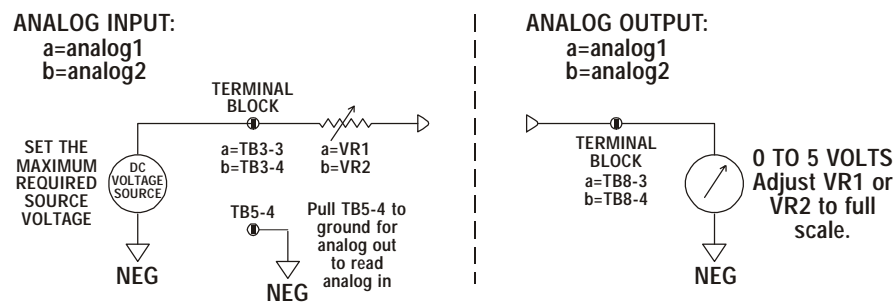
- 3.3.2 Analog 2 - 0 to 20mA Calibration:** Connect a 1000 resistor between ANALOG 2 IN (TB3-4) and earth (if the T2160 is release 1 -subsequent releases have provision for fitting this resistor on the main PCB). Connect a current source to ANALOG 2 IN (TB3-4) and set to 20mA. Connect a voltmeter to ANALOG 2 OUT (TB8-4). Apply an earth to EXTERNAL INPUT 1 (TB5-4) which forces ANALOG 2 OUT to read ANALOG 2 IN and adjust VR2 for an output of 5 volts.

- ### 3.3 Digital Inputs:
- "REMOTE CONTROL LINK" comes with 8 digital inputs as standard. Six of these inputs are configured to TTL levels (LO=<0.8V HI=>2.0V). The remaining two digital inputs are configured as logic inputs only.

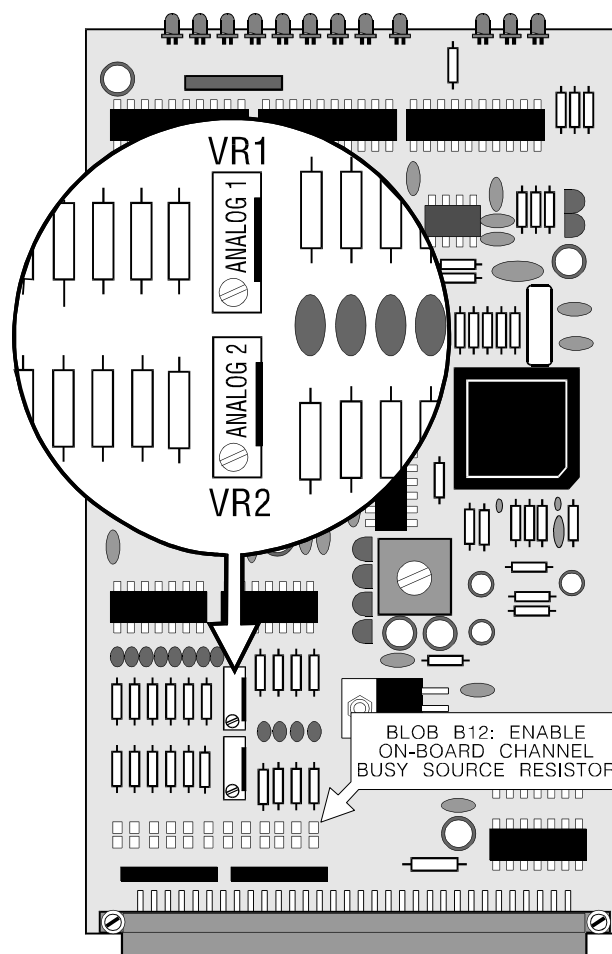
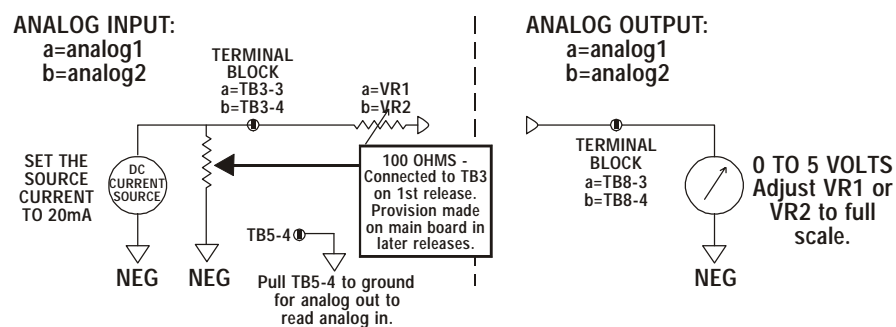
- ### 3.3.1 TTL Configured Inputs
- Active High = > 2.0 Volts  
Active Low = < 0.8 Volts

- ### 3.3.2 Logic Inputs
- Active High = > 1.4 Volts  
Active Low = < 0.3 Volts

## ANALOG INPUTS: CALIBRATING TO 0 TO 5 VOLTS



## ANALOG INPUTS: CALIBRATING TO 0 TO 20mA



**Figure 3:**  
Location of analogue calibration resistors VR1 & VR2

**4.0 OUTPUT SPECIFICATIONS:** "REMOTE CONTROL LINK" comes fitted with 2 analog outputs matching the corresponding inputs on the companion unit, and 8 digital outputs also matching and following the 8 digital inputs on the companion.

**4.1 Analog Outputs** Analog Outputs 1 and 2 = 0 to 5 volts

**4.2 Optional Output** 0 to 20 milliamps. To achieve this, de-solder the appropriate blob and insert a 250Ω resistor on the mother card as per figure 4 below (refer to the on-disk reference manual for more detail).

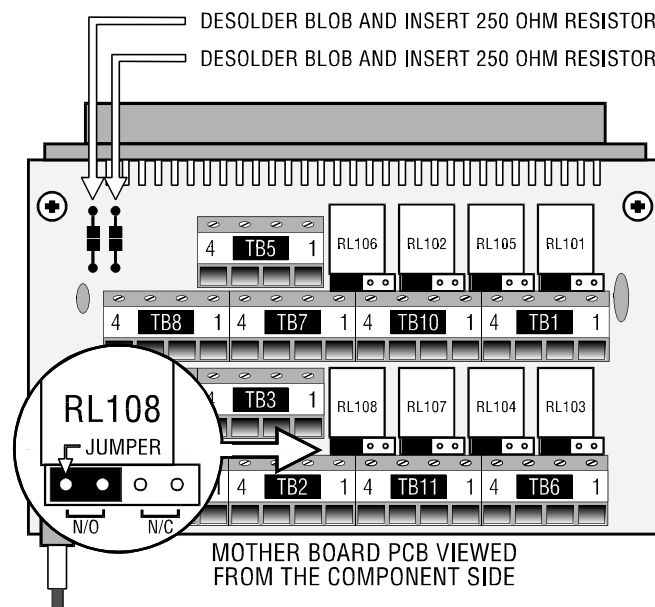


Figure 4: Mods for 0 to 20mA Output

**4.3 Digital Outputs:** Outputs 1 to 8 are open collector with a 300 milliamp sink capability. Optional relays can be fitted.

**5.0 INDICATORS:** Twelve LED's are provided on the front panel of the T2160 "REMOTE CONTROL LINK" module which provide for the following:

- 1 Power.**
- 2 Channel Busy.**
- 3 Transmit "ON".**
- 4 Circuits:** Provision is made to monitor 8 circuits. These indicators can be toggled between displaying the status (ON or OFF) of digital inputs or outputs by pressing switch 1 on the mother card (see fig. 5).  
Monitoring Input Circuits = INPUT/OUTPUT LED ON  
Monitoring Output Circuits = INPUT/OUTPUT LED OFF
- 5 8 Input/Output Indicators (LED's)**  
LED ON = Active Low (closed circuit to negative)  
LED OFF = Active high (open circuit)

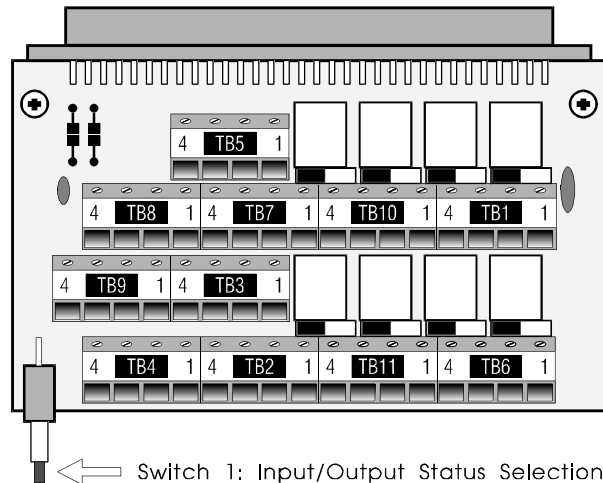


Figure 5: Location of Switch 1 on Mother Board

## 6.0 INSTALLATION:

**6.1 LOCATION OF UNIT:** The "REMOTE CONTROL LINK" unit has been designed for simple wall mounting, although it could equally well be used as a desktop unit.

For ease of operation it is suggested that the unit is fixed to a wall with the indicator lamps to the top and with the cables brought to the unit from underneath or from the back through holes located below and behind the mother board.

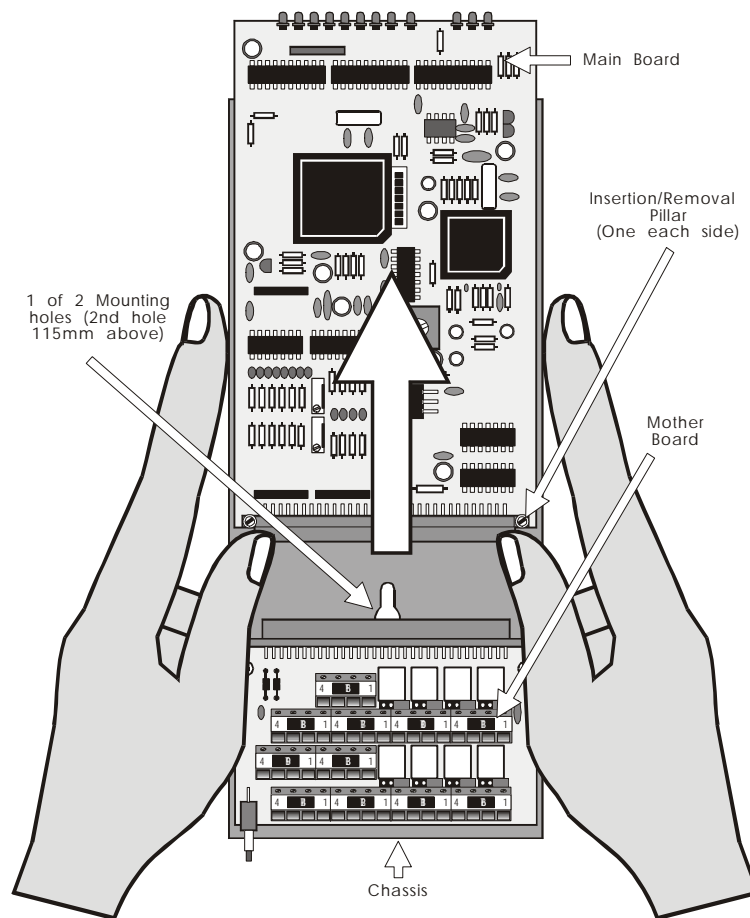
**6.2 MOUNTING THE T2160:** To fix the unit to a wall, remove the main telemetry board from the chassis by pressing each Insertion/Removal Pillar with both thumbs as shown in figure 6. This will expose the two mounting holes located on the underside of the chassis.

Drill a pilot hole in the wall where the top mounting screw is to be located. Screw the chassis to the wall with the top mounting screw and align the unit vertically before marking the position of the second mounting hole. Remove the unit from the wall and drill the second pilot hole before finally screwing the unit in place with both mounting screws.

Replace the telemetry board, ensuring that it is securely mated with the socket on the mother board by pressing down into place using the Insertion/Removal Pillars.

The unit can now be interfaced to a radio or line, and the inputs and outputs terminated as required by the system application. Refer to figure 7 for mother board terminal annotation.





**7.0 INTERFACE SPECIFICATIONS:** "REMOTE CONTROL LINK" is designed to operate over radio comm-unications systems but can also be used in line applications. "REMOTE CONTROL LINK" has the following interface options:

**7.1 Transmit Signal Output:** Although "REMOTE CONTROL LINK" is usually supplied with an unbalanced tone output (signal out) referenced to earth on TB2-3 (refer to figure 8), provision is made for fitting a 600Ω balanced output as described on page 12.

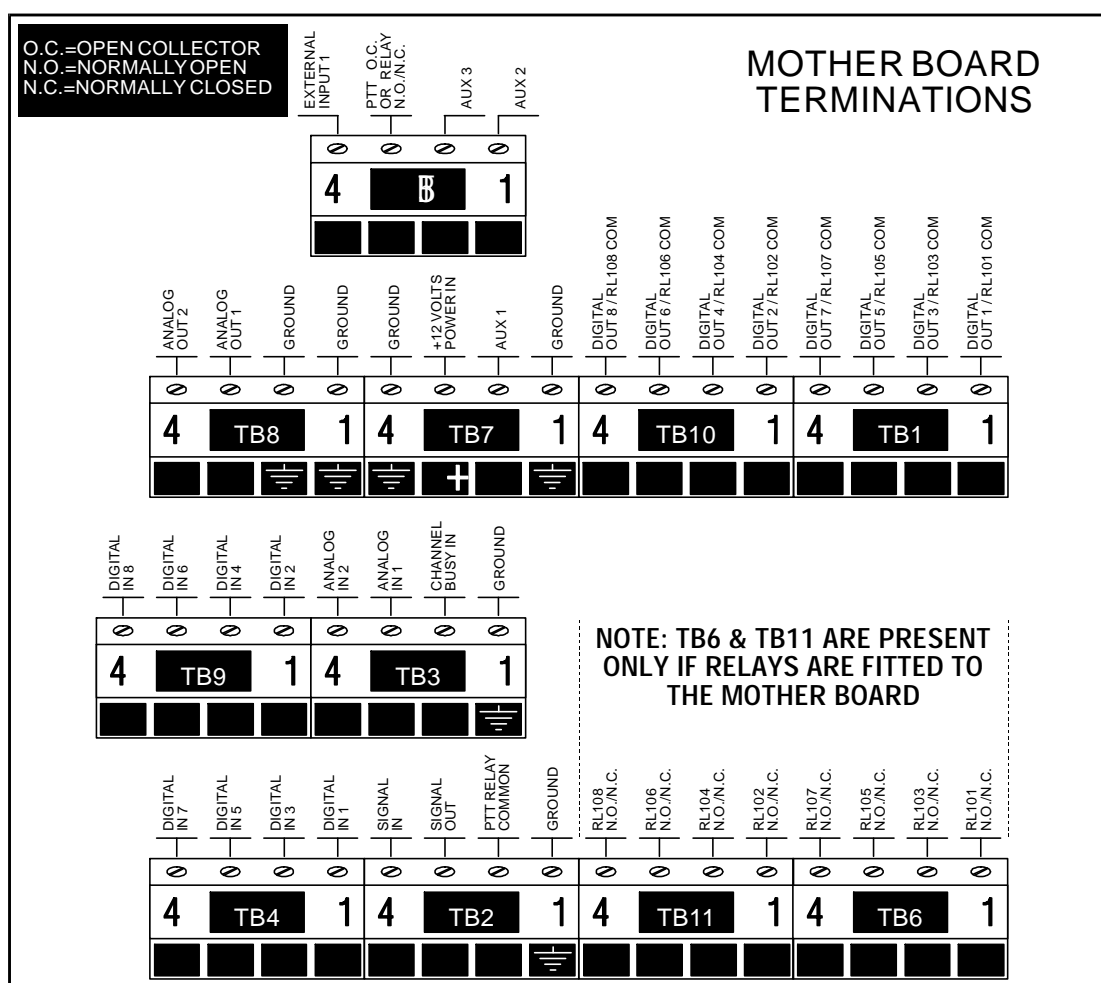
**7.2 Constant Tone Output:** A constant 1KHz tone output is provided to enable the setting up of transmitter modulation levels. If switch 1 on the mother board (see fig. 5) is depressed for 8 seconds, a constant tone is generated and PTT is asserted for 4 minutes after which it times out. The constant output can be cancelled at any time by pressing switch 1 again for 2 seconds.

**7.3 Receive Signal Input:** "REMOTE CONTROL LINK" is usually supplied with an unbalanced receive signal (tone in or signal in) referenced to earth on TB2-4 (refer to figure 8). However, provision is made for fitting a 600Ω balanced input as described on page 12.

**7.4 PTT Output:** Although "REMOTE CONTROL LINK" is usually supplied with an open collector PTT output, a PTT relay can be retro-fitted as described on page 17 (refer to figure 8).

**7.5 Channel Busy Input:** "REMOTE CONTROL LINK" supports radio channel "Busy". Three programmable options are available on this function.

- (1) **Active High:** When the channel is "Busy", the input signal interface sense provides a source voltage of at least 1.4 volts positive.
- (2) **Active Low:** When the channel is "Busy", the input signal interface sense provides a sink of less than 0.3V (i.e. normally an open collector transistor or relay contact to negative supply).  
**Note:** An on board source resistor is available by "Blobbing" pad B12 (as the normal factory default B12 is not blobbed - refer to figure 3 for the location of B12).
- (3) **LTR:** This option allows "REMOTE CONTROL LINK" to function on LTR configured systems. When programmed to this option the busy input responds to an Active High only.



| FUNCTION            | B       | A       | FUNCTION        |
|---------------------|---------|---------|-----------------|
| Digital Output 1    | 1 (1)   | (2) 1   | N/C             |
| Digital Output 2    | 2 (3)   | (4) 2   | N/C             |
| Digital Output 3    | 3 (5)   | (6) 3   | GND             |
| Digital Output 4    | 4 (7)   | (8) 4   | GND             |
| Digital Output 5    | 5 (9)   | (10) 5  | GND             |
| Digital Output 6    | 6 (11)  | (12) 6  | GND             |
| Digital Output 7    | 7 (13)  | (14) 7  | GND             |
| Digital Output 8    | 8 (15)  | (16) 8  | GND             |
| N/C                 | 9 (17)  | (18) 9  | N/C             |
| Channel Busy OUTPUT | 10 (19) | (20) 10 | AUX1 Output     |
| AUX2 OUTPUT         | 11 (21) | (22) 11 | AUX3 Output     |
| Relay Common        | 12 (23) | (24) 12 | Relay Common    |
| N/C                 | 13 (25) | (26) 13 | Reset Input     |
| +12v (Power IN)     | 14 (27) | (28) 14 | +12v (Power IN) |
| GND                 | 15 (29) | (30) 15 | GND             |
| Signal Output       | 16 (31) | (32) 16 | GND             |
| Signal Input        | 17 (33) | (34) 17 | GND             |
| Tone In             | 18 (35) | (36) 18 | Tone out        |
| Analog Output 1     | 19 (37) | (38) 19 | GND             |
| Analog Output 2     | 20 (39) | (40) 20 | GND             |
| Channel Busy        | 21 (41) | (42) 21 | GND             |
| Spare Digital Input | 22 (43) | (44) 22 | GND             |
| Digital Input 1     | 23 (45) | (46) 23 | GND             |
| Digital Input 2     | 24 (47) | (48) 24 | GND             |
| Analog Input 1      | 25 (49) | (50) 25 | GND             |
| Analog Input 2      | 26 (51) | (52) 26 | GND             |
| Analog Input 3      | 27 (53) | (54) 27 | GND             |
| Analog Input 4      | 28 (55) | (56) 28 | GND             |
| Analog Input 5      | 29 (57) | (58) 29 | GND             |
| Analog Input 6      | 30 (59) | (60) 30 | +5V (Power OUT) |
| Analog Input 7      | 31 (61) | (62) 31 | GND             |
| Analog Input 8      | 32 (63) | (64) 32 | GND             |

**Table 1: Mother Board/Main Board 64 Way Connector Pinouts**

## 8.0 OPTIONS

**8.1 FITTING OPTIONAL PTT RELAY:** If not already supplied fitted, a PTT relay (RL1) can be retro-fitted to the main board as shown in figure 8.

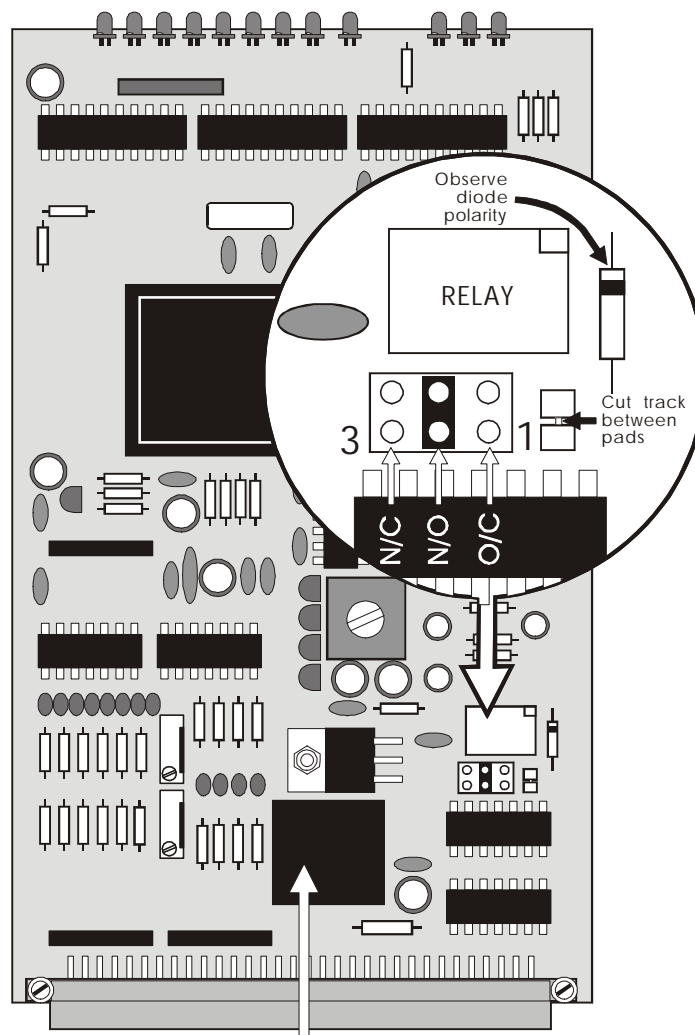
### METHOD

- (1) Place RL1 (Sigtec Part) into T2160 PCB as shown in figure 8 and solder in place.
- (2) Fit D3 (IN4148) diode and solder in place. Check that diode polarity is observed.
- (3) Cut the fine track shorting PC Blob 20 which is located on the top side of the PCB next to the relay.
- (4) Place shorting connector across required relay contact selection:  
Relay contact options:
  - (1) Open Collector
  - (2) Normally Open
  - (3) Normally Closed
- (5) When completed test T2160 as required.

## 8.2 FITTING OPTIONAL 6000 TRANSFORMER: An optional 6000 Line Transformer can be retro-fitted to the "REMOTE CONTROL LINK" unit.

### METHOD

- (1) Place transformer onto the T2160 PCB assembly in the location illustrated in figure 8 and solder into place.
- (2) Cut or un-solder PC Blobs 15 and 16 located (and identified) on the underside of the PCB beneath the transformer.
- (3) Solder PC Blobs 18 and 19 located next to Blobs 15 and 16.
- (4) The transformer is now ready to use.



LOCATION OF OPTIONAL 600 OHM TRANSFORMER  
BLOB PADS ARE LOCATED UNDERNEATH  
ON THE REVERSE SIDE OF THE PCB

## 9.0 ELECTRICAL SPECIFICATIONS

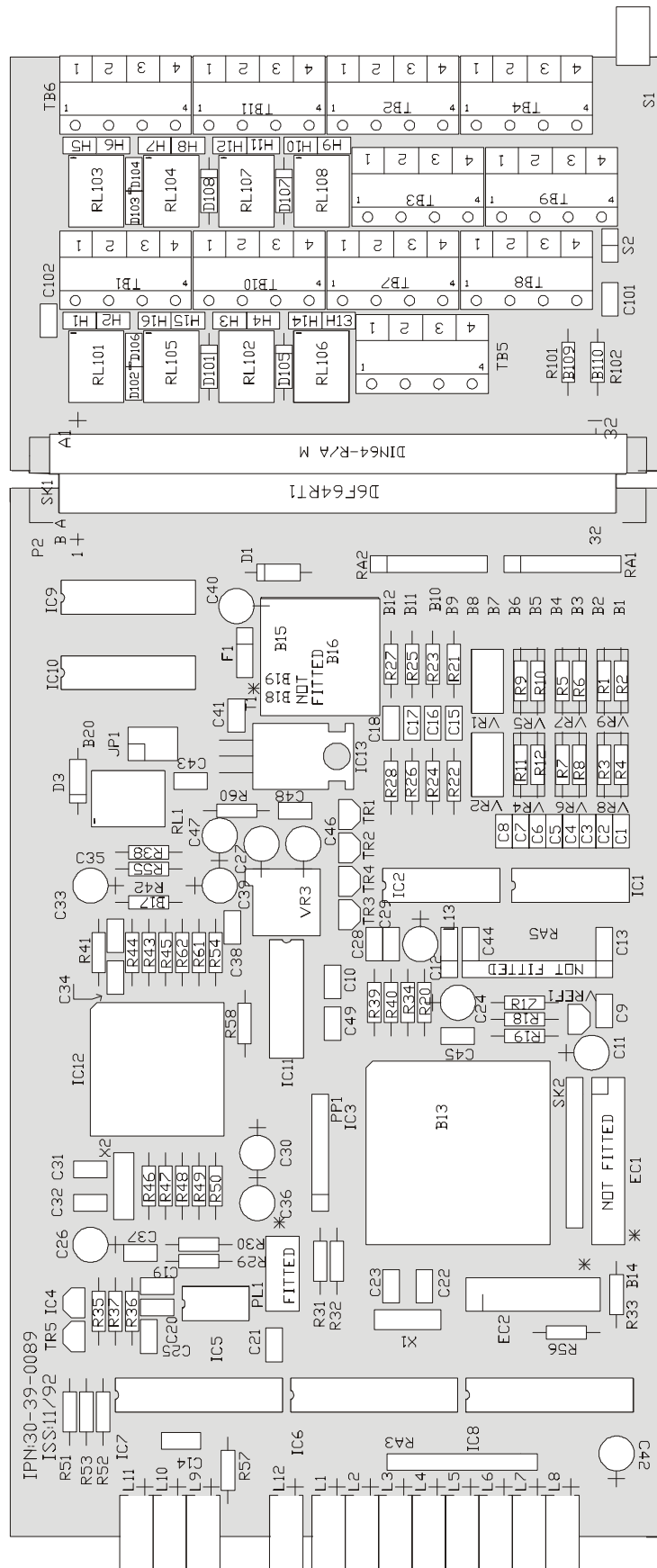
|                         |   |
|-------------------------|---|
| OPERATING VOLTAGE       | 7-17 Volts DC. -ve common                 |
| OPERATING CURRENT       | < 60 milliamps (All LEDs on)              |
| OPERATING TEMP. RANGE   | -10EC to +60EC<br>Optional -20EC to +70EC |
| TONE SETS               | CCIR, EEA, EIA, ZVEI1,2,3, PZVEI, DZVEI   |
| FREQUENCY TOLERANCE     | ±0.03%                                    |
| FREQUENCY STABILITY     | ±0.01%                                    |
| ENCODE OUTPUT LEVEL     | 0dbm 600O balanced                        |
| ENCODE OUTPUT IMPEDANCE | 600O balanced, 2KO unbalanced             |
| AUDIO INPUT SENSITIVITY | > 30mV RMS                                |
| AUDIO INPUT RANGE       | > 50KO unbalanced or 600O balanced        |
| LEAD-IN-DELAY           | Programmable                              |
| TONE PERIOD             | 20, 40, 60 & 100 milliseconds             |
| DECODE BANDWIDTH        | Optimized on selected Tone Period         |
| INPUT IMPEDANCE ANALOG  | 100KO                                     |
| INPUT SOURCE ANALOG     | Adjustable 1 to 30 Volts or 0 to 20mA     |
| INPUT IMPEDANCE DIGITAL | 100 KO                                    |
| I/P SOURCE DIGITAL      | < 0.4v = Lo > 2.0v = Hi                   |
| OUTPUT ANALOG           | 0 to 5 volts or 0 to 20mA                 |
| OUTPUT DIGITAL          | Open Collector or optional relays         |
| INDICATORS (Misc.)      | Power, Tx On, Busy                        |
| INDICATORS DIGITAL      | 8 LED's (ON or OFF)                       |

## 10.0 TROUBLESHOOTING: If trouble is experienced, follow the steps below:

- (1) Check that power (nominal 12 volts) is connected to the unit. A power ON (Green LED) indicator is provided.
- (2) Ensure the unit is correctly coded for your system. If the T2160 can be read from and re-programmed to, using the P9932 programming kit then the main components on the module are still functioning correctly.
- (3) Check that the T2160 module has at least 6V at the input to the regulator D1 cathode.
- (4) Check that sufficient level (greater than 30 millivolts RMS) is available at the input (TB2-4) to ensure proper decode performance.
- (5) Check that ENCODE tones are transmitted when any input switch change is activated. Place a oscilloscope or audio monitor on (TB2-3) and observe tone sequence. Check that the ENCODE Tone output is sufficient level to modulate the associated transceiver to at least 50% modulation (adjust VR3 if required). Also check that PTT relay operates and is wired correctly to the associated transceiver and keys it to ON during tone transmissions.
- (6) Check Busy indicator (Yellow LED) functions on receipt of and incoming call from the associated transceiver.
- (7) If the Output Indicators (LED's) are illuminated but the associated Output relays (relay or circuits connected to TB1 and TB10 or TB1,TB6,TB10 and TB11 if relays are fitted to the mother board) are not mirrored then check IC 9 and 10.

If these checks fail to provide any results, return the module to SIGTEC or it's authorised representative, freight pre-paid, for repair.

## T2160 COMPONENT LOCATION



10-73-0000 T2160 REMOTE CONTROL SIGNALLING UNIT PCB

MANUAL ISSUE 0793 - PCB ISSUE 11/92

**10-73-1000 T2160  
TERMINATION BOARD  
(MOTHER BOARD)**

